FEB 19 1913

JOURNAL OF ELECTRICITY

POWER AND GAS

Devoted to the Conversion, Transmission and Distribution of Energy

Entered as second class matter May 7, 1906, at the Post Office at San Francisco, Cal., under the act of Congress March 3, 1879.

VOL. XXX NO. 7 SAN FRANCISCO, FEBRUARY 15, 1913 PER COPY, 25 CENTS

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BY C. F. BACKSTRAND.

SLUICES, FISHWAYS AND LOGWAYS.
BY B. A. ETCHEVERRY.

ELEMENTS OF STEAM POWER PLANT DESIGN.
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HOW TO GET PUMPING INFORMATION.
BY R. B. MATEER.

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RIVERSIDE'S MUNICIPAL POWER PLANT

BY C. F. BACKSTRAND.

In 1895 Riverside voted 20-year bonds of $40,000 to be used in constructing a substation and distributing lines. These bonds were to be paid for in twenty installments, together with interest as it became due. There was built a substantial brick building to serve as the substation and 3-83 1/3 kw. Wagner transformers were installed with 10,000 volt primaries and 2000 volt secondaries connected delta to delta. There was also included a switchboard with the necessary instruments and switches. About 12 miles of distributing lines were built. This was thought by many at that time to be in excess of anything that would be required for a long time to come.

Unique Mission Street Lighting Posts at Riverside, California.

From these small beginnings there are today three separate sources of power, one from the steam plant, one from the 10,000 volt line and the other from the 33,000 volt line. The feeder circuits are so connected that they can be supplied with current from either source. The city is buying its power from the Edison company on two distinct rates. The power delivered on the 10,000 volt line is bought by the horsepower, figured from the readings of the voltmeter and ammeter as already mentioned, while the power delivered on the 33,000 volt line is bought by the kw. figured from the reading of a voltmeter. These feeder circuits are delivering power for both lights and motors so that the power factor is always varying. Circuits with high power factor are supplied with power from the 10,000 volt line and the circuits with low power factor from the 33,000 volt line. This switching back and

forth has apparently not affected the service as much as it would appear, for it can be done without losing any of the load and the change only comes about once a day.

Load Conditions.

The city has developed a large motor load which consists mostly of irrigating plants, although it also furnishes power for every enterprise within its distributing system. The power rates are computed on a sliding scale ranging from 6c a kw.-hr. to 2c, with a minimum of two dollars a month, while the lighting rate is 9c a kw.-hr., with 50c a month as the minimum. The minimum rate for power in this city is a special feature, for no matter what the connected load, it holds good. There is no charge made to the consumer for the transformers used. This minimum charge has been satisfactory, although in the past there was often times an advantage taken by the consumer in that he guessed at what his load would be and installed a motor much larger than he needed. This has lowered the power factor on some of the circuits more than it should be. Much more attention is paid to the motor installation now so that this bad feature is being overcome.

Steam Plant at Riverside.

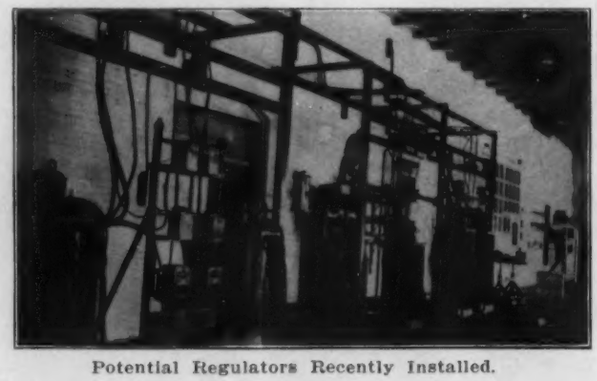
The feeder circuits are all three-wire, three-phase. In the business section the transformers are connected in banks of three, feeding three-phase 220, three-phase 110 and single-phase 110. The longest feeder circuit is about 11 miles.

The arrangement for the purchase of power for the last few years has been such that the steam plant has been operated but little. It has, however, always been in readiness to pick up the load should the service over which either transmission line be such as to demand it. On a good many occasions this has proved to be a great help. The steam from the boilers is also used by the street department in heating oil for road purposes. There is a large storage tank holding several cars of oil located near the station and steam is always kept circulating through pipes in this tank.

Supply House and Renewals.

There is also maintained by the city a complete stock of electrical supplies for retail purposes, besides a large stock of material for construction work for their own use. All supplies are sold as near cost as possible. In addition to this all lamps that are sold by the city are renewed free of charge, including the Mazda lamps from 20 watts to 500 watts, whenever burned out. If a new consumer, who has just been connected up has no lamps and he wishes to take advantage of free renewals, it is necessary for him to purchase his first supply from the city. These lamps are all stamped with the city mark and only lamps with this mark are renewed. It is also necessary for him to bring the lamps to the city office to get his renewals. During the month of November, 1912, the lamp renewals amounted to about $500, and one interesting fact was that the cost of the carbon renewals and the Mazda renewals did not vary over $15 for this same month. It has also been found by the city that the average bill to consumers using light has not been any less because of the use of these high efficiency lamps, but that the consumer just uses that much more light.

When the Mazda or tungsten lamps, as they were first called, were put on the market it appeared for a while as if the city could not maintain this system of free renewals with this type of lamp. They specified at the purchase or renewal of a tungsten lamp that it must be installed in a fixture controlled with a wall switch and that the lamp should hang straight down. The consumer was cautioned as to how to carry the lamp. Regardless of this, if the lamp was carried to its destination without being broken it was installed oftentimes in positions just opposite to the directions. This got so bad that the city executives refused to let the consumer take the lamps with him.



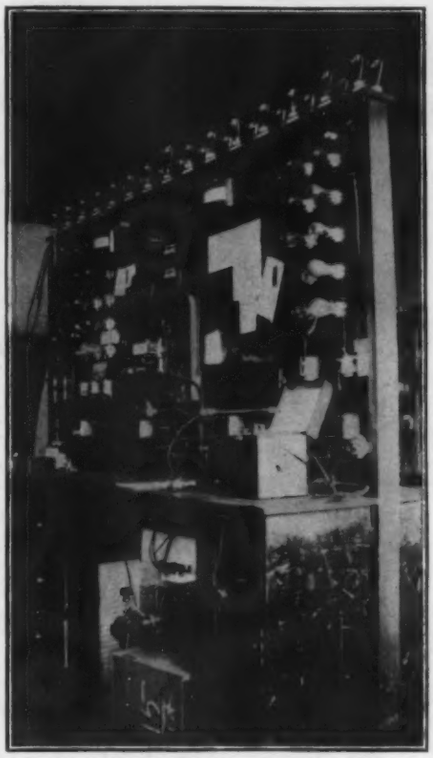
Potential Regulators Recently Installed.

A lamp man was consequently sent to install them and if he found that the requirements were not met with, he brought them back.

This was a big step in the right direction, for it lowered the cost of Mazda renewals enough so that the city could afford to keep up this system with this type of lamp, although a good many consumers still abused the privilege, taking the lamps out after they were installed and using them wherever and however they pleased. It was not long, however, until these lamps were made with the filaments much stronger so that now the customer is allowed to take his lamps and install them wherever he wishes.

Wiring Department.

There is a wiring department in connection with the plant. Wiring of all sorts is done—from the repair of a key socket to the wiring and installing of a pumping plant. There are, however, no contracts



Meter Testing Panel.

taken on any work, everything being done on a strictly time and material basis. For any small work which only requires a few minutes, such as repairs of switches, sockets, or putting in fuses, no charges are made.

The city also has an efficient meter department. This department has charge of all the installing and reading of meters, besides the testing and repair work. All meters are tested before they are installed and in addition to this the power meters are tested after they are installed. This department goes over all of the light meters about once in two years, all of the power meters twice a year and in the case of the larger consumers at least four times a year. In conjunction with the meter department is a motor department, where repairs on all sizes and types of motors are made, including transformer repairs and tests.

Unique Street Lighting.

The citizens of Riverside pride themselves on their street lighting. In the past two years they have been installing an ornamental system of street lighting in all of the downtown streets. To carry out the mission style of architecture, the posts for the street lighting have been made of cement with three lights and a cross on top. All of these posts are equipped with tungsten lamps. Up to date there has been 599 of these posts installed. In the outer sections the method has been to install a 16 c.p. lamp about every 150 ft. Some of the streets are lighted in this manner for a distance of 9 miles, there being at the present time about 2500 of these lamps, including 54 arc lamps connected in multiple. There is now under construction several miles of ornamental lighting work. The total cost per kw.-hr. of current consumed for street lighting, including cost of maintenance and office expense, has been $.0216.

The value of the substation and steam plant, including the 12 miles of distributing lines did not exceed $80,000, while the present value of the plant is placed at $320,249.96, including 112 miles of lines. The brick building first put up has been added to until now it is several times as large. The land owned by the city and used for the electrical department occupies half a block. During the first two or three years of operation the load did not exceed 200 h.p., while during the past 10 months the average daily load has been over 1000 kw. and the plant has been added to until now it has a capacity of about 1800 kw.

Statement of Progress.

The total current received and distributed for the year 1911-12 was 4,900,180 kw.

The total revenue	$148,096.83
Total expense	102,031.81
Net earnings	46,065.02
Total surplus	8,245.59
Total depreciation fund	50,197.13
Total number of consumers of light	3,302
Total number of consumers of power	396
Total number of consumers	3,698

Detail View of Mission Ornamental Post.

The plant employs 32 people constantly, most all of whom own their own homes. During the existence of the plant no damage suits, lives lost or fires have been caused by faulty construction or negligence of duty on the part of employes. All bonds have been retired as they became due and also all interest on the same paid by the profits of the plant.

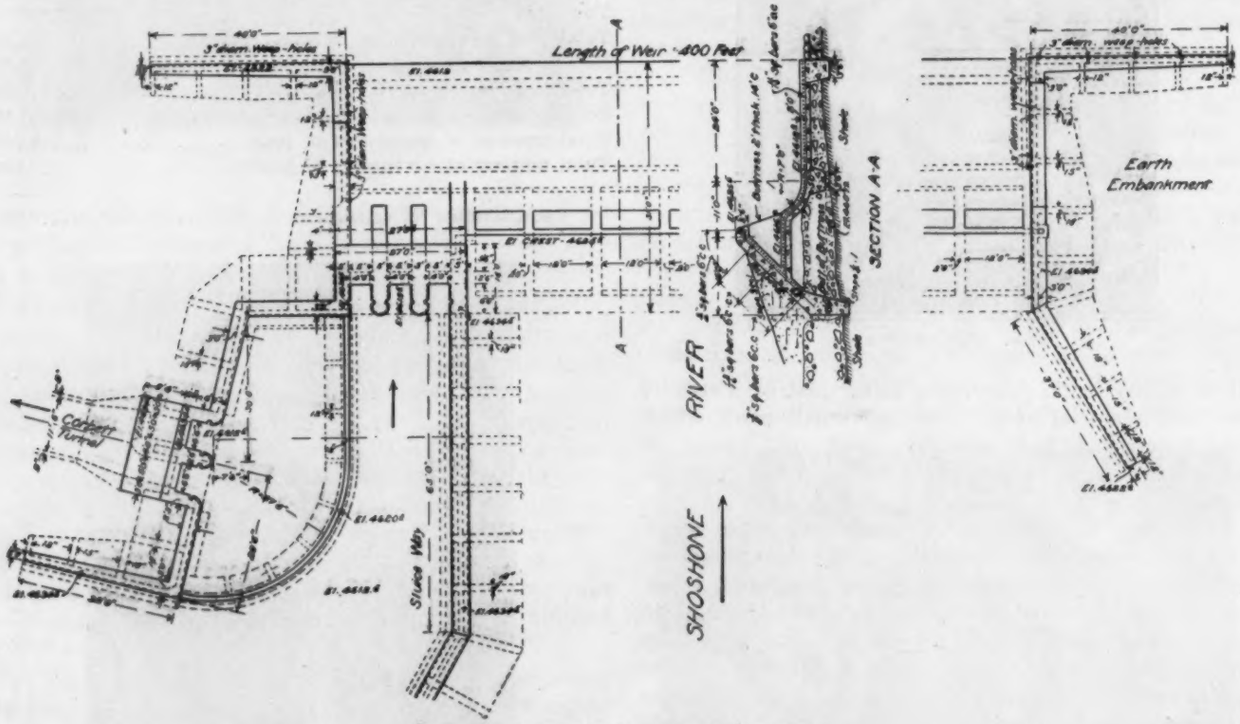
ELECTRICAL PUMPING AND IRRIGATION

SLUICES, FISHWAYS AND LOGWAYS.

BY. B. A. ETCHEVERRY.

A scouring sluice or sluiceway is an opening made in a closed weir, while an undersluice is an opening made through the body of the weir and does not extend to the top crest of the weir. The object of these sluices is to allow the passage of sand and silt and to keep a clear channel in front of the headgates and to prevent the entrance of sand in the canal. Undersluices are only used for high diversion weirs and where the volume of silt and sand is not large. As the chief purpose of the sluices is to keep a clear channel in front of the headgates, the sluices should be located at this end of the weir. The scouring effect is maximum at the opening itself and diminishes with the distance upstream from the sluice, in some cases higher velocities through the sluices, the lengths obtained should be increased 50 per cent. To confine the scouring effect the upstream wall can be continued downstream to the end of the floor. This wall with the parallel bank of the river forms the downstream scouring channel. The bank of the river must be protected by a wing wall or by paving which will extend for a distance equal to the length of the floor.

The effect of the sluiceways described above is to form a deep channel in front of the gates. While this is very desirable and necessary, it has the disadvantage that it throws the force of the current on one flank and on sandy streams with water carrying considerable silt may have a tendency to form islands



Dam and Headworks of Shoshone Project.

extending only a short distance. To concentrate the scouring effect in front of the headgates which may be necessary for streams carrying much silt, a channel can be formed by building a wall parallel to the headgates at a distance from them equal to the width of the sluices with a floor in between and extending upstream beyond the upstream edge of the headgates. This is well illustrated by the accompanying plans of the sluiceway in the granite reef dam on the Salt River, Arizona, at the intake of the south canal, and by the plan of the sluiceway in the Corkett dam on the Shoshone River, Wyoming. On sandy foundations it is necessary to extend the floor at the sluiceway a considerable distance downstream to protect the stream bed. The design of floor thickness, floor length and length of riprap is based on the same principles as weir floors. However, because of the above the weir. To prevent this and to keep a channel in the center of the stream, scouring sluices in the center of the stream would be desirable. However, the difficulty of access to them during flood times is a great objection and in some cases their use would be impraticable.

The only practical method of preventing silt islands is to use a lower weir with collapsible gates or shutters to raise the weir crest during the low water period. These difficulties are usually encountered only with broad rivers carrying considerable sand and silt.

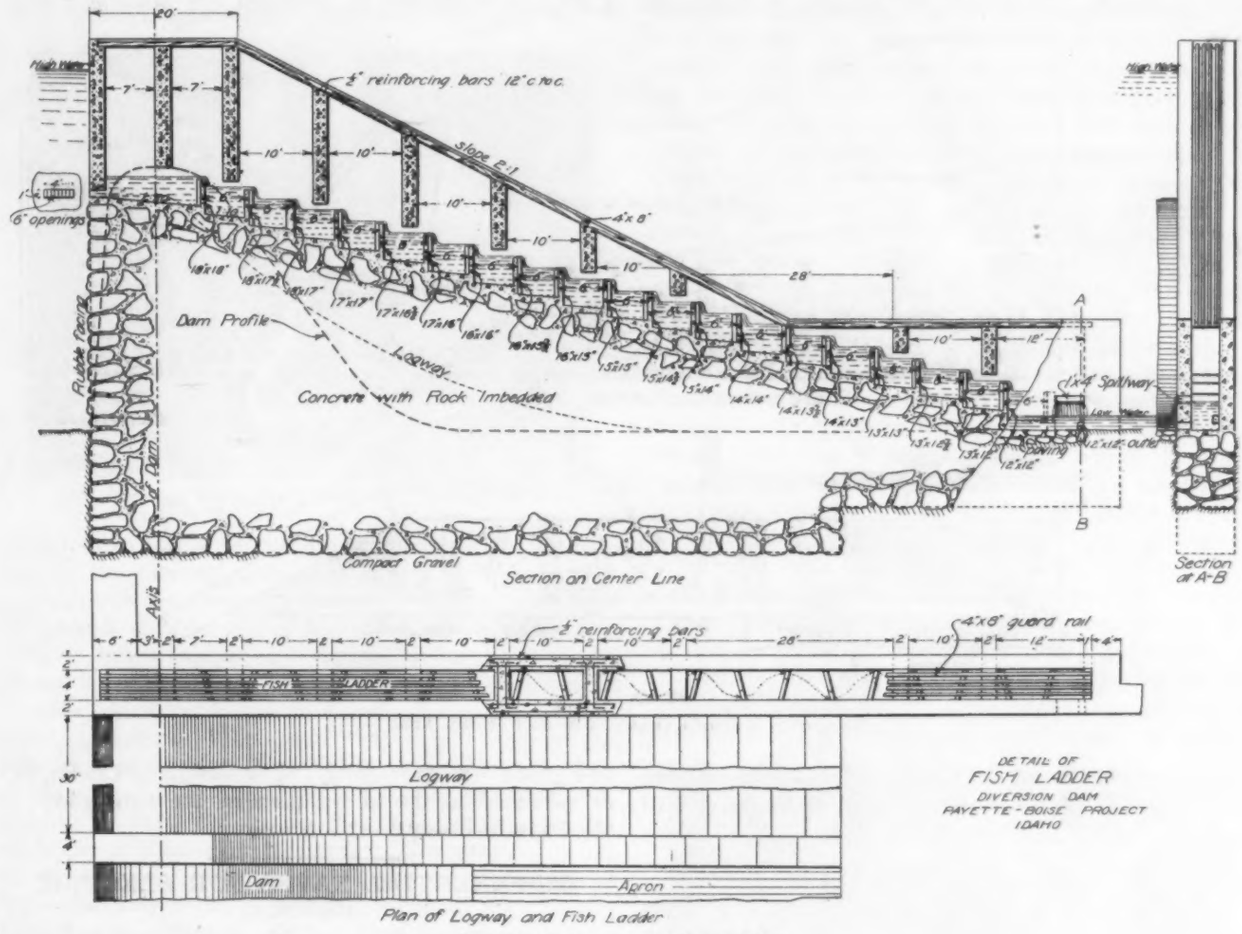
The other factors to be considered in the design of the sluiceway are: (1) relative elevation of sills of headgate and sluiceway; (2) width of openings; (3) superstructure.

1. The efficiency of the sluices depends largely

on the relative elevation of the sills of the headgates and the sluices. The sill of the sluices is generally placed at the level of the stream bed or else at low water level. In any case the sill of the sluice should be made lower than that of the headgates by at least 2 to 4 ft. and preferably more, unless this would produce an excessive pressure on the sluice gates.

2. Where the amount of sand and silt is considerable, the scouring sluice should be designed to offer as little obstruction as possible and allow a large velocity to wash out any deposits. This can best be done by using enough large openings with comparatively narrow piers, or by using collapsible shutters. The practice in India, where the rivers carry considerable silt, is to use wide openings from 10 ft. to even 20 ft., with thickness of piers equal to about 1/3 the width of the openings and to make the total cross section area of the opening equal to that of the headgates.

3. The superstructure, when lift gates are used, consists of the operating platform and piers with grooves into which the gates are fitted. For wide gates, roller bearings are used. The piers, gates and platform are designed as for headgates. When collapsible gates are used no piers or operating platform are usually necessary. It is difficult to make collapsible gates which will work successfully for heads above 4 to 6 ft. Often there is no advantage in using them in the sluiceway, because trees and large floating debris can be trained with log booms to pass through a log way or over the dam.

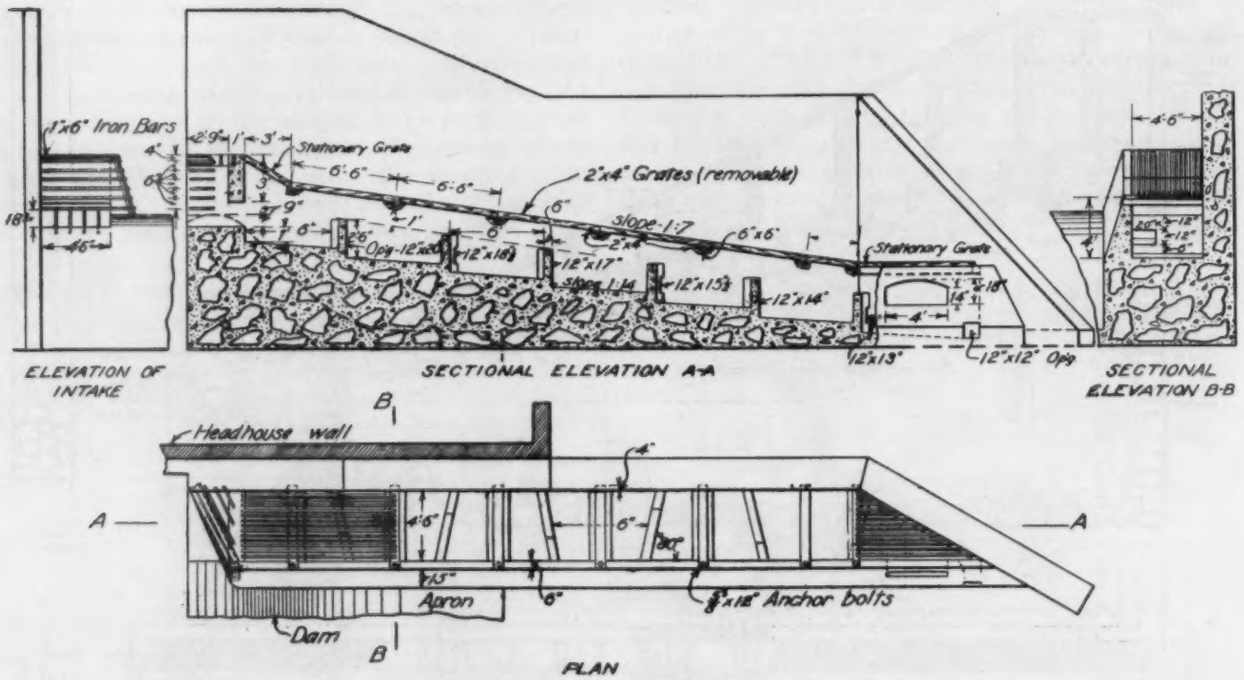


Typical Logway and Fish Ladder.

Fish Ladder.

The laws of many states require that fish ladders be placed in all weirs or dams to permit the fish to pass upstream. For rivers whose summer flow is small the water may be confined to a channel upstream and downstream from the sluiceway. For these cases it is necessary to place the fishway adjacent to the sluiceway. A fish ladder consists of a series of basins forming a set of steps. These basins are connected by means of openings so that the fish can pass from the lower basin to the upper basin. The inlet to the lower basin must lie lower than the low water level on the downstream side of the weir and the outlet to the upper basin is on the upstream side of the weir below the weir crest. To insure a full supply in each basin the upstream opening for each basin is made a little larger than the downstream opening so that the openings gradually diminish from a maximum at the top to a minimum at the bottom. The openings in each basin are usually made at the bottom and at opposite corners so that the fish must follow a zigzag path. This arrangement leaves one corner where the water is comparatively still where the fish can rest. This is necessary, especially for high weirs. The difference in elevation between basins regulates the velocity through the openings and should not be in

excess of about 18 inches. The slope of the fishway should not be steeper than one foot vertical to four horizontal. The width of the fishway is from 4 to 5 ft.; the baffles forming the basin are often placed on a 60 to 80 degree angle to the longitudinal axis so as to form trapezoidal basins. The average length of these basins is about 6 ft. and the depth of water from 2 to 4 ft. The minimum sized opening between basins should be 12 by 12. The fishway should be covered with a grating or screen to prevent interference, but the light must not be shut out or the fish will not use it. The design of fishways is illustrated by the accompanying drawings of fish ladders in the diversion dam of the Yakima-Sunnyside project and of the Payette-Boise project, Idaho.



Sluiceway in South Canal Dam, Salt River, Ariz.

Logway.

In those states where logging is practiced laws have been enacted making it necessary to provide for free navigation of streams for logging purposes. This requires ready means for passage of logs either over or through the dam. When overflow weirs are on streams carrying enough water to insure a sufficient depth of water over the crest at all times during the year, it will not be necessary to provide a logway, as the logs will pass directly over the main body of the weir. When the stream flow is not sufficient the flow may be largely confined to a smaller channel formed by the scouring sluices in front of the headgates and there may not be sufficient depth of water passing over the crest to carry the logs. For these conditions it is necessary to provide a logway.

The logway is generally formed by lowering the crest of the dam for a short section adjacent to the fish ladder and scouring sluice. The sides of the logway channel are formed by two walls running parallel with the direction of flow, one of which may be the side of the fishway or the abutment to the dam. In many cases to avoid an excessive waste of water it is desirable to build the logway as narrow as possible and the inlet is controlled by a gate which may be opened only when necessary. The width of the channel may be as small as 6 to 8 ft. and usually ranges from that up to 20 or 30 ft., depending on the amount of logging and water available. The sill of the logway is made at least 4 ft. lower than the crest of the weir. To guide the logs into the logway a timber boom starts from the head of the logway on a small angle with the direction of flow and extends upstream a distance sufficient to intercept the floating timber and guide it to the logway. The design of the logway is indicated in the above plan of the fish ladder in the Payette-Boise diversion weir.

DIFFERENTIAL RATES FOR ELECTRIC SERVICE.

A member of the Rate Research Committee of the National Electric Light Association has prepared a comprehensive argument as to why electric companies should adjust their rates so as to get all of the business possible. This will be published in its entirety in the forthcoming issue of the Bulletin, the conclusion being that differentials should be made enough in favor of large customers (and of certain uses, such as cooking, etc.) to get their business and that a single general rate should be made for the general public at least as low as would be obtained under free competition.

The company should adjust the rate to the various classes so as to get the greatest volume of business among which to divide joint costs, and in order to do this, first make sure that no class is supplied at a loss, and that each class bears as much as it can contribute (or would have paid under free competition) of the joint costs. This means make the rates proportional to the value of the service, less the savings due to monopoly.

ELEMENTS OF STEAM POWER PLANT DESIGN

BY C. H. DELANEY.[1]

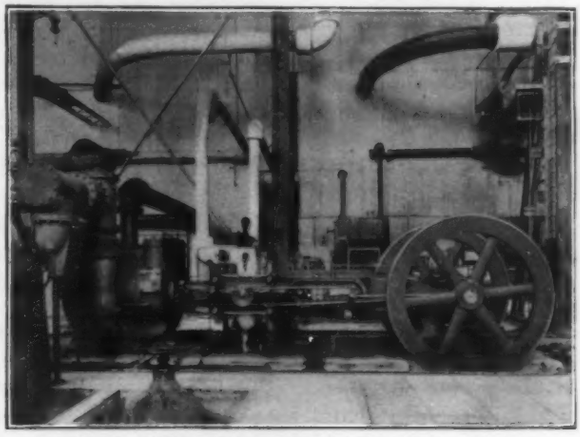
General Description. I.

I have been asked to discuss the subject of "Steam Auxiliaries to High Tension Transmission Systems." This title might as well have been written simply "Steam Power Plants," for the reason that a steam auxiliary to a transmission system is in fact a complete power plant having its full complement of boilers, engines, generators, condensers, pumps, etc., of

Dry Vacuum Pump for 12,000 kw. Steam Turbine.

sufficient capacity to generate enough electricity to supply the city or town in which it is located. In many cases the steam plant is not only large enough to furnish electric power for the city, but it is also used at times to transmit electric power back to the transmission system. This is especially the case at times when water is low in mountain lakes and reservoirs so that the water power generating stations are handicapped by lack of sufficient water and are compelled to call upon the steam plants to help them out. During the last few months this condition has existed with the Pacific Gas & Electric Company. Owing to the dry winter last year and the small amount of snow that fell in the mountains, the quantity of water available has been much less than is ordinarily the case at the end of the dry season, and for this reason more or less electric power has been transmitted every day from San Francisco and Oakland out to the country and smaller towns, instead of the power coming into the cities and supplying the city load.

To enable this to be done it is necessary for a company to be provided with complete steam power plants, just as complete as if there was no high tension transmission system connected with them. The steam power plant consists essentially of two main divisions, the boiler room where steam is generated, and the engine room where the energy in the steam is converted into mechanical and electrical energy. The boiler room contains the boilers, furnaces, superheaters, economizers, smokestacks and all the auxiliary machinery necessary to operate them, such as feed pumps, fuel oil pumps, feed water heaters and oil heaters. In the case of a coal burning plant, the boiler room also contains the mechanical stokers, coal and ash handling machinery, and forced draft apparatus. On the Pacific Coast, however, where oil is used as fuel almost exclusively, these are eliminated. The engine room contains the prime mover and electric generator with their necessary auxiliaries. The prime mover is at present in almost every case a steam turbine instead of a reciprocating engine, as was formerly the case. The turbine, which may be either vertical or horizontal, is direct connected to an electric generator. In the case of a vertical turbine, the generator is placed above the turbine and the condenser which receives the steam after it has done its work in the turbine, is placed directly below the turbine. A number of auxiliary machines are required to operate the turbine. The principal ones are the pumps required to maintain the vacuum in the condenser. These are the wet vacuum pump which discharges the condensed steam from the condenser and delivers it back to the boiler room to be returned to the boilers; the dry vacuum pump which takes the non-condensable gases, such as air, which may have been dissolved in the feed water, out of the condenser; and the circulating pump which circulates the cooling water through the tubes of the condensers. In a large turbine installation the dry vacuum pump is itself a fair sized Corliss engine with fly wheel, valve gear and all the appurtenances required to make up a complete reciprocating pumping engine. The wet vacuum pumps are much smaller as they handle only the liquid, which does not expand as air does, in the rarified atmosphere of the condenser. They are usually of the centrifugal type, driven by either a small steam turbine or a motor. The circulating pump is also of the centrifugal type. It must be capable of handling large quantities of water—from fifty to seventy-five times as much as the wet vacuum pump—and is driven by either a compound engine, an electric motor or a steam turbine, depending on its location, the amount of steam available, and other minor considerations.

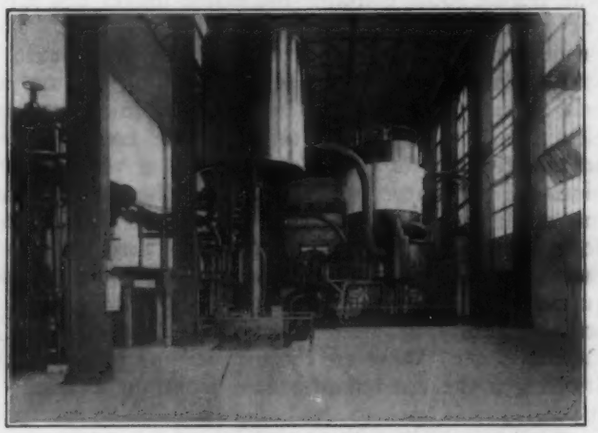


Typical Boiler Room Containing Eight 750 h.p. Water Tube Boilers, Installed in Oakland, Cal.

In addition to the foregoing, there are the oil

[1]Steam power plant expert in maintenance and operation department, Pacific Gas & Electric Company.

pumps for circulating the oil through the bearings of the turbine. In a vertical turbine installation there are two sets of these oil pumps, the middle bearing pumps which circulate oil at a moderate pressure through the upper and middle bearing of the machine, and the step bearing pumps which circulate oil at a very high pressure, 1000 lbs. to the sq. in., through the step bearing. The high pressure oil forces its



Engine Room Showing 12,000 kw. Vertical Steam Turbine, and Accumulator for Regulating the Step Bearing Oil Pressure.

way into the step bearing under the main shaft and has power enough to raise the whole shaft with its weight of all the revolving parts of both the turbine and the generator off its seat, so that while the turbine is in operation, the shaft is actually floating on a film of oil, not over two hundredths of an inch thick. A hydraulic accumulator is provided in the step bearing oil system to regulate the oil pressure and provide a certain amount of storage capacity to be used in case the step bearing pump should stop. This is provided with an automatic device which controls the operation of the pumps. If the pressure falls, the accumulator drops until it actuates a lever which opens a valve admitting more steam to the pumps. These at once speed up, increasing the oil pressure and causing the accumulator in turn to rise until the reverse action takes place and the pumps slow down again.

The auxiliaries required for the generator are the exciter, the transformers, and the switchboard with all its intricate wiring and costly instruments. It is a good practice to install a steam driven exciter for use in starting up and a motor generator for exciting the fields in regular operation.

All these machines have to be intimately connected together by means of piping. There is the high pressure piping connecting the boilers together and carrying the steam from the boilers to the turbine. There is the exhaust piping to carry the exhaust steam from all the auxiliary machines to the feed water heater and the feed piping to take the water from the feed water heater back to the boilers. There is also the circulating water piping which carries the circulating water from the bay or river through the condenser tubes and back to the place whence it came. Owing to the large quantity of circulating water required, these pipes are of necessity of large size, running from 42 in. to 60 in. in different plants, In many cases canals are provided for the inlet and outlet so as to bring the water supply close to the condenser. The pipes leading to and from the condenser are then very short so that the loss due to friction in these pipes is reduced to a minimum.

A steam power plant is not unlike a great manufacturing establishment where the raw material is gradually converted into the finished product. In the case of the power plant, the raw materials are fuel, air and water and the finished product is the electric energy delivered at the bus bars. The manufacturing process is a continuous one. There is a continuous flow of fuel oil from the storage tank to the furnaces. Here the fuel combines with the oxygen of the air generating the heat necessary to convert the water in the boiler into steam. The steam generated in the boiler flows through the superheater and steam pipe to the turbine and passes through the several stages of the latter where its energy is converted into mechanical motion. The final transformation takes place in the generator where the mechanical motion is converted into electric energy, which is continually drawn off as fast as required.

After this brief description of what the plant consists of, I will in the next issue take up the question of the design of the plant so far as the methods of determining the size of the various apparatus are concerned.

PROPOSED JOINT SURVEY OF POWER AT THE DALLES.

The Columbia River power site at The Dalles, Ore., offers a practical and powerful natural water power. The states of Washington and Oregon, and the United States, are urged by engineers who have examined the location to join in constructing a great dam at this point to supply power for all purposes. An appropriation of $150,000 is to be asked, this to be distributed one-third to each of the agencies of government.

It is proposed to build a dam 180 ft. in height, which is to shut out the waters of the Columbia at the Five Mile rapids and a canal 300 ft. in width and one and one-half miles long to the power house, which is to be built at Big Eddy. The river is to be channeled through solid rock 1400 ft. wide, which is to be controlled by a removable dam 70 ft. in height. This will create a fall one-half as high as that of Niagara Falls.

Six miles of the Celilo canal, which is now slowly advancing toward completion, will be completely drowned by this project, but the river raised in its stead, it is asserted, will improve navigation.

It is stated that 300,000 horsepower can be furnished twenty-four hours a day and 365 days in the year at a cost of $6.89 per horsepower.

In addition to this, 236,000 additional horsepower can be furnished for eight months of the year, making a total horsepower of over one-half million. The $6.89 per horsepower cost price is figured to include all maintenance, estimates and other charges, figuring interest at 4 per cent.

A plant erected at a cost of about $23,000,000 would be large enough to supply thirteen cities the size of Seattle today.

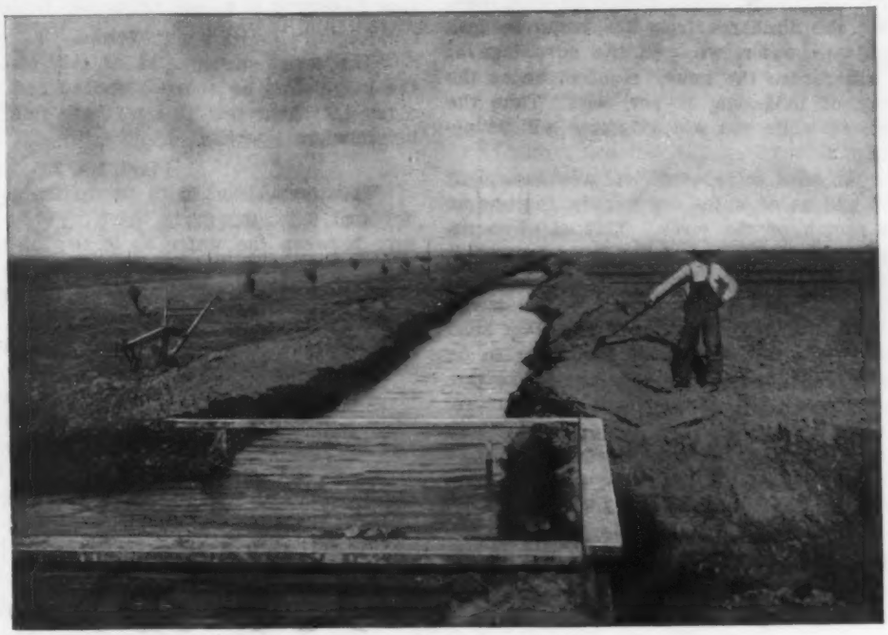
READINESS TO SERVE METHODS

HOW TO GET PROPER PUMPING INFORMATION.

BY ROSS B. MATEER.

"Tule" lands and peat islands protected from the tidewater and the floods of winter by the use of huge sand embankments are capable of intensive cultivation (1) by reason of fertile soil, (2) the judicious use of water. Both are essential for abundant crops and one has but to view the green lands—the islands of the Sacramento River—to gain convincing proof of their fertility and the profit assured by installing motor operated pumping units (1) for reclamation, (2) for irrigation.

Pumping units may be constructed and utilized for either purpose but good practice dictates separate installations for each, combining the characteristics essential for economical and efficient operation.



The Irrigation Canal.

To obtain the best operating conditions pumping apparatus is installed today with specifications prepared either by some disinterested engineer or by representatives of the manufacturer. Even inquiries should contain general information that the sales-engineer may quote comprehensively on the equipment best adapted, from superficial judgment, for the particular location and service desired.

Information Desired With Inquiries.

A series of fifteen questions, intelligently answered, permits of a tentative proposition on which exact data may be based. Those frequently asked of the land owner are prepared as below indicated:

1. Number of pumps wanted.
2. Gallons per minute or second feet wanted.
3. Is service to be continuous or intermittent?
4. What is the source of supply, lake, stream, ditch or well?
5. If a well, give description, including depth and inside diameter of well.
6. If well has been tested, give result, gallons per minute, distance that surface water recedes to when pumps ing, and distance when not pumping.
7. Is water to be pumped, clear, gritty, fresh, salt or acidulous?
8. How close to the water can pump set?
9. Give shortest lateral and vertical length suction pipe can be.
10. Give lateral distance and elevation in feet from the center of the pump to the point of discharge.
11. If either or both suction and discharge pipes are in place, give accurate description, including length, diameter, number and radius of bends.
12. Type of pump wanted, whether horizontal, vertical, single, series, turbine or deep well.
13. Kind of driving power. If steam or gasoline engine, give power engine will deliver to the belt. Face and diameter of pulley, r.p.m.
14. If the pump is to be belted to an electric motor, give horsepower diameter and face of pulley, revolutions per minute.
15. If the pump is to be direct connected to electric motor, state if we are to furnish motor, and if current is to be alternating current. If so, give voltage, phase.

Specifications.

When the negotiations have developed to a point such as warrant exact data on the installation, its cost and conditinos governing the performance of the plant, articles of contract are prepared and when duly signed by both parties constitute an order. Such agreements are only complete when accompanied with drawings showing a cross section of the embankment and the approximate position of the apparatus.

Specifications that are a model for precision, and completeness, illustrative of an installation now under way are here quoted, sketch of levee being the same as that published last week in this department.

Specifications of a Pumping Plant.

Conditions and Proposals.

Attached hereto you will find section of the levee and proposed 10 in. pumping plant, together with a profile along the base of the levee inside of the fence line and the direction of the water flow in the alfalfa field.

From the section of the levee you will see that at this time there is a difference between the water in Steamboat Slough and the land on the inside of the levee of 4.5 ft., and that from the water to the top of the levee on the roadway the distance at this time is 21.7 ft. Providing that you cut down on the levee 5 ft. for your pipe line you would have a maximum pumping head to start the pump of 16.7 ft. A 10 in. pump has a capacity of 3000 gallons of water per minute. Using a 12-in. pipe line through the levee we have a friction head to overcome of 2 ft., making a total maximum pumping heat of 18.7 ft., which required 14.25 theoretical horsepower. Giving the pump an efficiency of 60 per cent, which is reasonable, we require 23.5 h.p. This is the power required under the present maximum conditions. Now providing that the discharge from the pump be lead into a sump filled with water, we gain the advantage of siphonage which will reduce the power required under the continuous pumping of irrigation 25 per cent. Thus the normal power required while you are irrigating will be approximately 18.5 h.p.

We suggest as the most satisfactory and adequate plant to deliver the 3000 gallons of water per minute, the one as illustrated in the sketch of the levee. This plant is designed to be installed on the inside of the levee because it is handier to have the pumping plant on the inside as it will be free from high water and inasmuch as the pumping plant can be so installed without any "U" suction bend in the suction line there is little or no advantage to be gained by placing it on the outside of the levee. We propose to install a 25 h.p., 1100 r.p.m. motor and a 10 in. pump, together with suction pipe as itemized in detail under "Details of Machinery." We have itemized the prizes for the different machines and work so that you will have a complete understanding of our bid.

Details of Machinery.

1-25 h.p., 1200 r.p.m., 220 volt, 60 cycle, 3-phase, a.c. electric motor	$309.00
Necessary change of motor-pulley, difference	5.50
Switch and fuses	5.00
40 ft. of 10 in. x 5 ply No. 1 rubber belt, $1.49 per ft., less 50 per cent	30.00
1-10 in. centrifugal pump fitted with suitable pulley and suction elbow, $400, less 40 per cent	240.00
Approximately 132 ft. of 12 in. No. 12 double riveted, asphaltum dipped, caulked and chipped steel pipe. This pipe is to be flanged every 25 ft. and to be supplied with two bends so that it will be carried without undue bends into the levee. Price of pipe and rivetting flanges	160.20
7 sets of 12 in. cast iron flanges, together with the necessary bolts and gaskets, at $12.50 net	87.50
1-12 in. check valve, $75, less 30 per cent	52.50
1 large hand priming pump, valves, pipes and fittings, net	12.00
Approximately 42 ft. of 12 in. No. 12 double rivetted asphaltum dipped, caulked and chipped steel discharge pipe	46.80
2 sets of flanges, bolts and gaskets at $12.50 net	25.00
1 flange and blind flange for the end of discharge pipe to be put on in case of high water in river	12.50
Total cost of machinery, pipe, valves and fittings	$986.00

Freight and Haulage.

We will deliver all the machinery and supplies at the steamer at San Francisco. You to pay the freight and to haul the machinery to the place of installation.

Foundations.

We will supply the necessary rock and gravel for the foundations under the pump and motor for the sum of Twenty-five ($25.00) Dollars.

Installation.

We will construct the foundations, install the plant in a first-class and workmanlike manner. You to make the necessary excavations and fill in the levees and to supply the helper to our installing engineer. Having installed the plant we will operate same for a period of 10 hours to show that it successfully fulfills the conditions given previously. The cost of this installation will be Fifty ($50.00) Dollars.

Sump.

You are to construct the sump to gain the benefit of siphonage and we will supply you drawings and material dimensions for same.

Price.

The price of the entire plant as itemized above will be One Thousand Sixty-one ($1061.00) Dollars.

Terms.

The terms of payment of this plant to be cash upon the installation as above described and demonstration after a ten (10) hour test that we have fulfilled this contract as hereinbefore specified.

Plant No. 2.

This proposition is to fix up the present 15 in. siphon line and 8 in. pump; to drive it by a motor. The difference between the water as it now stands and the surface of the ground is 6.8 ft. with approximately no friction in the siphon line when delivering the capacity of an 8 in. pump, 1600 gallons of water per minute. Therefore we propose to supply you with one 10 h.p., 1120 r.p.m., three-phase, 60 cycle, a.c. motor, $203. Suitable change of pulley, difference, $5.50. Switches, $5.00. This makes a total of $213.50 for the machinery required. We suggest that you use the taper you now have on hand, the 10 in. suction pipe, 8 in. pump; 10 in. discharge pipe and belt. The work of installing this plant can be done by yourself under the supervision of our installing engineer, for which there will be no charge providing the work is done at the same time that the other work is being installed.

General Conclusions.

Specifications of this character are a result of a thorough investigation of the conditions under which the equipment must operate and insure a proper and efficient installation, satisfactory both as to material used in the construction as well as the cost of operation. Each proposition is then a problem, the correct solution of which is a guarantee of satisfaction. More attention should be given to the proper equipment and its installation, than to its operation as the first two features insure the latter.

The variation in price between the high and low bid may be considerable, yet seldom warrants the granting of the contract to that firm whose low figure is their qualification. The best material, its proper installation, superintendence and reasonable profit are the cause of the larger figure and are worthy of such attention as to frequently result in the elimination of all low bids. Experience demonstrates the fact that extremely low figures are not the natural result of clean competition but the elimination of items as before mentioned. Mechanical lift of water by electric power is not experimental but a necessity and the convenience warrants an installation that is satisfactory, not for this year only but that will possess the qualities of economy, efficiency and durability.

TRANSFORMER CONNECTIONS.

BY W. A. HILLEBRAND AND E. R. SHEPARD.

(Continued.)

Star Primary, Star Secondary.

Various arrangements are shown in Figs. 10, 11 and 12. Of these, 10 and 11 are feasible, but Fig. 10 requires unusual voltage ratings for either lamps or motors. The connection in Fig. 12 is not practicable, because any unbalanced single phase current drawn by, for instance, transformer No. 1, must, in the primary, pass through 2 and 3, which now act as choke coils, distorting the voltages to neutral with possible

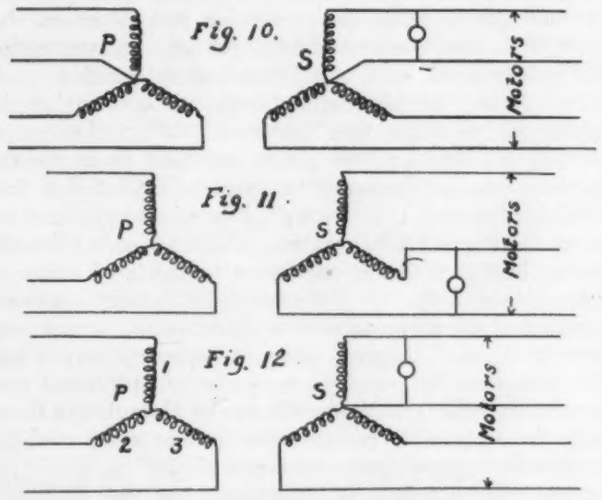


Fig. 10.

Fig. 11.

Fig. 12.

breakdown of the lightly loaded transformers, due to excessive voltage and core loss. This connection is essentially that of Fig. 5.

Using the connection of Fig. 11, even with balanced load, the voltages across each transformer may be over 15 per cent larger than the ideal proportion of 57.8 per cent of the delta e.m.f., due to the introduction of a third harmonic by the star connection. The core losses would also probably be increased, though to what extent it is difficult to say since the e.m.f. and flux waves are no longer simusoidal.

Star Primary, Delta Secondary.

Under ideal conditions an extremely satisfactory service is obtained with the connection of Fig. 13, with primary neutral grounded at power house or substation and on all transformer banks. Then any unbalanced current is drawn chiefly through the loaded transformer and at the power factor of the load.

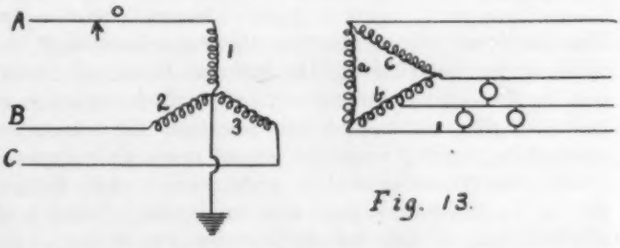


Fig. 13.

However, this arrangement has one drawback which, in an extensive system, practically forbids its adoption. If the primary line grounds on any feeder is constitutes a short circuit in both directions for the entire system. For instance, assume a ground at "O," Fig. 13. Transformers 2 and 3 are still supplied with normal pressure, and through their secondaries, b and c, maintain normal pressure on transformer No. 1, feeding the short circuit from both directions and constituting a short on all three phases. This applies to all transformer banks connected to the same feeder or on feeders leading from the same bus, so that after such a ground many installations in the entire territory served are out of commission until the primary fuses have been replaced.

To obviate this difficulty the ground connection must be removed. Any unbalanced current due to single phase loading must, in the primary, flow through the other two transformers equally, as in Fig. 12. The secondaries of these transformers, a and c of Fig. 13, are now in parallel with the loaded transformer, and the excess primary ampere turns in each maintain voltage sufficient to supply current to the load. The unbalanced current in two transformers, as a and c, Fig. 13, will be half of that in the loaded transformer.

Delta Primary, Delta Secondary.

For distribution voltages of moderate range and limited radius, where the self-induction and capacity of feeders are not too great, this is perhaps the most serviceable transformation. On high voltage systems of considerable length, comparable to that of many high-power transmissions, a ground on an isolated delta causes high frequency oscillations of the natural periodicity of the system with resonant rises of potential which have been known to shatter insulators and interrupt service.

Three-Phase to Two-Phase Transformations.

This is illustrated in Fig. 14.

With balanced non-inductive loading the currents in the two branches, a o and b o, are out of phase with the e.m.f a b by 30 degrees, leading in one-half

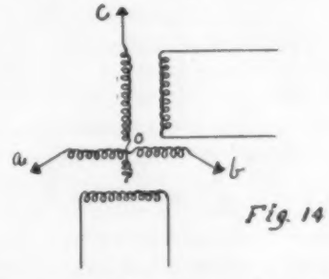


Fig. 14

of the transformer and lagging in the other half. The two transformers may be loaded to 93 per cent of their combined capacity without overloading transformer a b. The losses in transformer c o are somewhat less than normal, due to fact that only 87 per cent of one winding is used.

Owing to the fact that the power factors of the currents in the two halves of transformer a b are not alike, these two sections will regulate differently, with consequent unbalancing under load, which unbalancing will not be serious if the transformer is provided with a sufficient number of coils on the side connected to the three-phase line so that there may be proper interlacing. If, however, coil a o is wound on one leg and b o on the other of a core type transformer, then, due to excessive magnetic leakage, the unbalancing may be prohibitive.

(To be continued.)

JOURNAL OF ELECTRICITY
POWER AND GAS

PUBLISHED WEEKLY BY THE

Technical Publishing Company

Rialto Building, San Francisco

E. B. STRONG, President and General Manager
A. H. HALLORAN, V. P. and Managing Editor
ROBERT SIBLEY, Treasurer and Editor in Chief
C. L. CORY, Secretary and Special Contributor
A. M. HUNT, Director and Special Contributor

On Library Cars of all Southern Pacific Trains.

TERMS OF SUBSCRIPTION

United States, Cuba and Mexico	per year,	$2.50
Dominion of Canada	"	3.50
Other Foreign Countries within the Postal Union	"	5.00
Single Copies, Current Month	each	.25

NOTICE TO ADVERTISERS.

Changes of advertising copy should reach this office ten days in advance of date of issue. New advertisements will be accepted up to noon of Monday dated Saturday of the same week. Where proof is to be returned for approval, Eastern advertisers should mail copy at least thirty days in advance of date of issue. Entered as second-class matter at the San Francisco Post Office as "The Electrical Journal," July, 1895.

Entry changed to "The Journal of Electricity," September, 1895
Entry changed to "The Journal of Electricity, Power and Gas," August 15, 1896.
Entry changed May 1, 1906, to "The Journal of Electricity, Power and Gas," Weekly.

FOUNDED 1887 AS THE
PACIFIC LUMBERMAN, CONTRACTOR AND ELECTRICIAN

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Utility Service at Riverside

The city of Riverside, in Southern California, has worked out its own salvation, so far as street lighting is concerned, in a remarkably artistic manner. This beautiful tropical district so rich in the lore and traditions of the early Spanish adventurer and priest, has not overlooked the possibility of carrying out the decoration of its principal streets in fitting compliance with this early life. Posts of cement with three lights appearing as bells in mission cloisters, surmounted with a cross as described elsewhere in this issue, are thus seen to have an aesthetic value of high order.

In the distribution of service to customers this city, too, has evolutionized ideas of lamp renewals fully in accord with the latest central station practice. It will be interesting to briefly summarize the mode of procedure here instituted. First the lamps, carbon filament and tungsten, are sold to customers as near cost as is possible to compute. All lamps thus sold by the city are renewed, free of charge, in sizes from 20 watts to 500 watts. The customer, himself, must, however, bring the lamp to the city office to get the renewals. In November, 1912, lamp renewals amounted to a valuation of about $500, practically evenly divided between the old carbon filament and the tungsten lamp. A close study of individual customer's accounts indicates that even though the tungsten has per unit reduced the power consumed by enormous proportions, still practically no variation in the monthly bill is observed, for the customer has now found more uses for electric power consumption than he formerly entertained.

There are still many problems of decorating features suitable to advertise the individuality of a municipality yet to be worked out. Moreover lamp renewals and proper relations with the public must still be unsolved problems for future years to unfold. Nevertheless, ideas of progress and evolution in the small network, such as the Riverside installation, serve to substantially record such progress from time to time and often the newcomer forms his impressions as to the progressiveness of a community by observing the intelligence and taste shown in its street lighting effects.

The A. I. E. E. Executive Committee vs. The Section

President Mershon of the American Institute of Electrical Engineers in a recent after-dinner speech very properly cautioned the local sections in regard to their taking action upon matters clearly prescribed in the constitution of the Institute as functions of the general Board of Directors or Executive Committee. He called attention to the fact that on a previous occasion the executive committee, having properly passed upon an important matter, were considerably embarrassed by finding that a subsequent action was taken by a section of the Institute, in direct hors de combat with the action of the general body. Such an incident is most unfortunate to say the least and clearly evidences the necessity of a word of caution from the chief executive of the Institute.

Some were prone to misinterpret Mr. Mershon's remarks on this subject as being a possible hint that

centralization of powers in the New York body would be attempted, thereby curtailing the usefulness of the section as a forum for debate on all questions of vital interest to the body at large. Such a misinterpretation is not only unwarranted but is successfully refuted by noting the broad gauge manner in which recent presidents and governing bodies of the Institute have conducted its affairs.

The constitution of the American Institute of Electrical Engineers clearly defines the duties of the Board of Directors, the highest governing body in the Institute, as pertaining largely to the appropriation of moneys, applications for admission and transfer, appointing of employes and fixing their salaries and in general to direct the business of the Institute. The rapid and widespread growth of the Institute is largely due to the recent broad policies inaugurated by recent governing boards. So long as the membership at large feel that such is the national policy, so long will the national organization continue to exert its helpful, invigorating influence. It would seem, then, that in the affairs of the Institute the utmost freedom of discussion throughout the length and breadth of its membership should be had on all subjects except those clearly delegated by the constitution to the governing board.

Proposed Diversion of Tahoe Lakes

Riparian rights and the value of Lake Tahoe as a scenic asset of California are at present seemingly arrayed against a project to utilize the waters of this lake for power and irrigation purposes in the State of Nevada. Engineers of the reclamation service propose to keep the raising and lowering of the lake within a range of six ft., while the property owners argue that a greater fluctuation than four ft. would cause damages amounting to millions of dollars, not alone due to the resulting depreciation of the lakeside as a natural scenic resort but also due to the damage to heavy investments in some sixteen resorts now located there. The lake has a surface of 192 square miles or 125,000 acres. Thus a two-foot dispute means the possibility of cutting off forever the irrigation of at least 50,000 acres of arid lands.

The Secretary of the Interior has appointed an eminent engineer and a well-known agriculturist to act as commissioners and ascertain the exact status of affairs in the controversy. The secretary and his commissioners may well weigh the final verdict with the utmost caution. It is a subject of far reaching importance to the arid West.

The diversion of waters from one state into another should be handled along the broadest possible lines to accomplish maximum development and usefulness of Western natural resources. By glancing through a digest of court decisions covering the question at issue it becomes evident at once that states may forbid by legislative action the taking of waters into other states where such waters do not naturally find their way into the foreign territory. Without such legislation, however, waters may be conducted from the state. In 1911 California enacted legislation making it unlawful to transport the waters of any lake or stream of the state into any other state for use therein. The enactment of the California law was to say the least a narrow-minded policy. The highest utilization of water knows no such limits as a state boundary, fixed alone by the whims and fancies of political evolution.

In 1901, the state of Kansas initiated a suit against the state of Colorado charging the latter commonwealth with wrongful diversion of the waters of the Arkansas River. The Supreme Court of the United States finally ruled that the uses of the waters of the Arkansas, which flow from Colorado into Kansas, must be so adjusted upon the basis of equality of rights as to secure as far as possible to Colorado the benefits of irrigation without depriving Kansas of the like beneficial effects of a flowing stream.

Hence it would seem to all broad-minded citizens that the present controversy over the Tahoe waters should be settled along similarly constructive lines, irrespective of a law which would harass ultimate development of Western arid lands. Many claim that the law of 1911 does not apply in the case at issue. If it should be ruled to apply the law might well be repealed.

This instance is illustrative of hundreds of other similar possibilities throughout the West. Whether or not the Secretary of the Interior, the state legislatures, the state engineer or a water commission has real jurisdiction in the matter, in any event, certainly an opportunity is offered in every such case for constructive ideas, wholly without a peer in almost any other problem now before the West.

The Steam Auxiliary

Fully as active as the hydroelectric development in the West, has been that of its twin sister—the steam auxiliary. Within the year just completed scarecly a large metropolitan district has been passed without kindly and costly additions being made in this important branch of central station economics. This growth has been so extensive and the size of units so wholly different from former practice that the designing engineer has at hand little published data to aid him in choice of his equipment. Search, if you will, even the proceedings of our national engineering societies, and little is to be found on Pacific Coast practice relating to steam auxilary evolution.

On another page of this issue will be found the beginning of an important series of six papers on the elements of steam power plant design. The author, Mr. Chas. Delaney, will set forth in this series much matter, hitherto unpublished, which will prove indispensable to the central station engineer in proportioning the various parts of his steam equipment. The boilers and their sizes, the condensers and their auxiliaries, and the prime mover with its countless niceties, will all be explained so far as their general relationship one with the other is concerned. The searcher will thus find new ideas in power plant apportionment, helpful in every detail.

Mr. Delaney speaks from a wealth of information acquired first as an undergraduate of a Western university and later in graduate investigation at Cornell. Years of practical experience in the testing department of the Babcock & Wilcox Boiler Works fully fitted him for his present position as a power plant expert.

PERSONALS

ITEMS FOR THIS DEPARTMENT ARE SOLICITED FROM ALL READERS

Geo. R. Murphy of the Electric Storage Battery Company is at Salt Lake City.

F. O. Sievers, sales engineer with the Fort Wayne Electric Works, is at Los Angeles.

E. G. Dewald, hydraulic expert with Pierson Roeding & Co., has returned to San Francisco from the East.

W. W. Lowe of the Electric Appliance Company at Chicago, is to be an attendant at the coming Jobbers' Convention.

F. L. McGillan, formerly with the California Pole & Piling Co., recently took charge of the pole department of Pierson, Roeding & Co.

H. V. Carter, president of the Pacific States Electric Company, returned last Thursday from an extended and very successful trip through the Northwest.

H. C. Goldrick, Pacific Coast sales manager for the Kellogg Switchboard & Supply Co., has returned to San Francisco from a trip throughout the Pacific Northwest.

J. E. Hascke, inventor of the Hascke storage battery and electric automobile parts, is at San Francisco, where it is possible that a manufacturing plant will be established.

N. H. Silver has succeeded **B. B. Beckett,** resigned, as manager of the Seattle office of Pierson, Roeding & Company. Mr. Beckett continues his electrical engineering practice.

W. S. Cone, former division manager at Sacramento, has been appointed manager of the eastern division of the Great Western Power Company with headquarters at Oakland.

A. L. Menzin of San Francisco has been appointed engineer for the Edgemoor Iron Works and left this week for Wilmington, Del., where he will hereafter make his headquarters.

Norton L. Taylor, of Tacoma, Wash., has been appointed special engineer to check up the construction work on the pole line of the Nisqually Power Plant, from La Grande to the Tacoma sub-station.

A. C. Haggenmiller, of the Washington Water Power Company, has assumed the duties of Statesman for the Jovian Order at Spokane. **C. R. Bean,** the former Statesman, having recently gone to Portland.

F. D. Nims, electrical engineer with the Western Canada Power Company at Vancouver, B. C., and chairman of the Vancouver Section of the American Institute of Electrical Engineers, is visiting the various Pacific Coast sections and making arrangements for the Coast meeting of the Institute which will be held at Vancouver, September 9-11, 1913. He is now at Salt Lake City.

W. L. Goodwin, manager of the Pacific States Electric Company, announces the appointment of W. F. Rawdon, F. B. Nightingale and T. H. Nelmes to the sales forces of their Portland, Los Angeles and San Francisco houses. Messrs. Rawdon and Nightingale expect to leave for their respective fields the latter part of the week. Mr. Goodwin, together with D. E. Harris, expect to join the party, leaving for Lake Spaulding about February 21st.

John C. Corbin, consulting mechanical engineer at Seattle, has been elected president of the Seattle Engineers' Club. **G. B. Harrington,** assistant general superintendent of the Seattle Division of the Puget Sound Traction, Light & Power Co., has been elected vice-president. **J. Thomas Dovey,** of the Seattle Engineering Co., is secretary and **Robert Howes,** consulting electrical engineer, is treasurer. Weekly luncheons are held at the College Club on Thursdays.

MEETING NOTICES.

Portland Jovians.

The Jovian Order at Portland gave a dinner in honor of Reigning Jupiter Frank E. Watts at the Imperial Hotel, February 1, 1913.

Electrical contrivances of many kinds contributed uniqueness to the entertainment. As the soup was served the room became dark and a huge red devil, patron of the organization, sprang into brilliant relief before startled eyes. F. W. Hild, as toastmaster, called upon one after another for comments. Mr. Watts urged more activity in propagating the co-operative principle, especially in the West, where power, mostly undeveloped, abounds. For the future he predicted a strength to the order and influence of its pronouncements excelled by none.

George R. Sailor, Statesman for Oregon, enumerated the propositions which the order has been working for, including the electrical contractors' license law, the agricultural extension measure, and the Celilo and Deschutes power development measures.

At the dinner in honor of Mr. Watts there were present: F. A. Barnicott, F. N. Simonton, Paul Maloney, G. Bump, A. B. Vander Wicken, A. H. Wahl, Burton R. Stare, C. R. Dederick, H. T. Van Riper, J. R. Wood, E. L. Van Dresser, C. J. Franklin, Horace S. Clark, A. C. McMicken, M. E. Connor, A. M. Wilson, W. E. Coman, A. E. Watts, F. W. Hild, George R. Sailor, J. E. Davidson, G. N. Barker, Russel K. Akin, L. T. Merwin, F. L. Whipple, L. M. Sherman, C. E. Condit, Burnett Goodwin, L. G. Fear, W. E. Peters, C. P. Potter, F. H. Smith, A. V. Olson, C. M. Wright, H. B. Rogers, A. L. Sailor, S. C. Jaggar, Wilfred L. Ingalls, William F. McKenney, W. C. Campbell, F. E. Meyers, E. W. Bonness, J. L. Thatcher, R. S. Fisher, H. R. Wakeman, W. B. Foshay, E. S. Whitney, H. Wells, J. L. Priest, I. N. Chamberlain, F. N. Averill, J. T. Ryan, R. G. Littler, R. F. Monges, C. P. Osborne, Edward A. West.

Oregon Technical Club.

The regular Tuesday luncheon at the Portland Grill was addressed by President Campbell of the University of Oregon, on "Future of Technical Education in Oregon." The presiding chairman being E. B. Thompson of the U. S. Engineer's office of Portland.

Mr. Campbell said in part: "In ten years the high school giving a four-year course have increased from 4 to 125."

"'The Entrance' requirement for the University of Oregon, into the Engineering Colleges, is 15 units of preparatory work." In relative division of the courses in the college course for the various branches of engineering as regards professional culture and liberal culture are as follows:

	Prof. Culture.	Liberal Culture.
Civil Engineering	2/3	1/3
Electrical Engineering	7/8	1/8
Railway Engineering	2/3	1/3
Sanitary Engineering	2/3	1/3

The University Extension work this year includes extension work in Engineering. The total enrollment in extension work is 400. The heads or assistants of the different departments, in ertension work visit these students outside the university about once in two weeks.

Mr. Campbell laid great stress upon the fact that engineering was getting to be differentiated into two branches—Industrial and Professional—which demanded different training and answered different callings.

He said that he desired suggestions from the Oregon Technical Club as regards the framing of a five or six-year course for engineers so as to include more general culture work, also to differentiate the public mind as regards industrial and professional engineering, and some systematic

basis on which to base the various degrees given for engineering work.

A motion was made and passed "That each organization represented in the Oregon Technical Club, appoint one member of their respective organizations, to represent them on a general legislative committee which is to co-operate with the educational institutions of the state, in order to further legislation which would promote the interests of technical education."

The subject for the next luncheon will be "Pertinent Legislation," and the American Institute of Architects will have charge.

Portland Section A. I. E. E.

The regular monthly meeting of the Portland Section of the A. I. E. E. will be held Tuesday evening, the 18th of February, in the club rooms of the Oregon Technical Club, at 247½ Stark street. A paper will be presented by Mr. L. W. Haller on "An Electrolytic Survey of a Small City."

A CO-OPERATIVE PLAN TO DEVELOP THE ELECTRICAL INDUSTRY.

Probably one of the most purposeful and important meetings that has ever been arranged for in the electrical industry, is that which has been announced by the Board of Directors of the Society for Electrical Development, Inc., for March 4 and 5, in the Engineering Societies Building, 29 W. Thirty-Ninth Street, New York City, to which the entire electrical fraternity, as well as the general magazine men, advertising agencies, etc., are invited.

The object of the meeting is to obtain from as many angles as possible, the various ideas of the many branches of the industry on the tentative plans that will be proposed in a most comprehensive program that will include papers and suggestions invited from, or promised, by such men as Henry L. Doherty, Joseph B. McCall, Dr. Talcott Williams, Thomas Commerford Martin, F. H. Gale, Reginald Pelham Bolton, George Harvey, William D. McJunkin, J. M. Wakeman, Hugh Chalmers, W. E. Robertson, A. W. Burchard, L. A. Osborne, J. C. McQuiston, and others.

Among the plans suggested will be that for a broad educational general magazine and class paper advertising campaign, together with plans for a comprehensive press bureau for the dissemination of news matter pertaining to things electrical and also a field department for co-operative and general educational work throughout the electrical and allied industries, architects, building trades and various manufacturing fields.

The Board of Directors of the Society, as an Organization Committee, have, of course, discussed and formulated divers concrete plans, but as the active work of the Society will effect practically every individual interested in the electrical business, it was thought that only by a broad discussion of the definite policy of the many lines of effort which the Society will endeavor to accomplish, could a plan be arrived at that would coincide with the thoughts of the many diverse but allied interests involved.

Considered as an infant, the electrical business has in something less than forty years, shown a wonderful development—a development that has probably never been equaled by any other industry, not even considering steam and gas.

Recent figures show that something over $10,000,000,000 is invested in the business, with gross earnings of something over $40,000,000 annually, in this country alone, from one branch—the central station industry. The total American annual expenditure on electrical service, apparatus and supplies, is in excess of $2,000,000,000, but should double that easily.

It is said that approximately 5 per cent of the total population of the United States gets his or her living more or less directly from electricity and its ramifications, and that fully 40 per cent of the aforesaid population uses electricity in some form or other every day, if only by the sending of a telegram, the use of the telephone, hopping on a street car, or pushing a door bell. And this enormous business growth can practically be said to have developed itself; for it is only in the last half dozen years that a few of the larger central stations and manufacturers have made any real effort toward educating the public to the use of what is still a stupendous mystery to the average layman. A brief glance at some of the selling and advertising statistics given in the December issue of the "Efficiency Magazine," statistics collected from many industries, show an advertising expenditure of from 1 to 2 per cent in the electrical business, as against 2 to 66 per cent in promoting other industries.

If this be true of advertising, it is only fair to assume that expenditures along other lines of salesmanship are relatively the same, and if the experience of these other industries is of any value, it would seem that electrical men are far behind as business developers when opportunities for expansion are considered. Will the industry allow, year after year, a consequent loss of business through lack of selling effort, or combine forces through the opportunity offered by the plans of the Society and carry out in the near future a series of campaigns which, under the direction of the representative men, who are giving a large portion of their individual time and energy to the movement, must be of an efficient and beneficial nature to the entire industry.

The plan as presented is so sane, so logical and so businesslike in its complete aspects, that it seems to have for its future, all of the many essential elements which make for success, and in the carrying out of the plans, there can be very little question, but that each individual member will profit from the small individual subscriptions, many dollars from each invested.

A complete program of the conference will be published in the near future, and as the policy and plans of the Society are of the utmost importance to the individual interests of all, a large attendance of the influential men of the industry is expected.

SAN FRANCISCO ELECTRICAL DEVELOPMENT LEAGUE.

The monthly meeting of the Electrical Development League of San Francisco, was held February 11, some 65 members being present. Proposed amendments to the League's constitution, enabling an affiliation of the Jovian Club with the League, as submitted by the special committee to consider the matter, were adopted, and final action will be taken at a special meeting to be called February 25.

The Golden Poppy Special Committee reports much interest and enthusiasm being taken in the organization of the special train party from the Pacific Coast to the N. E. L. A. Convention at Chicago, in June next. Already many have indicated their intention of joining the special train party.

A communication from Phil Dodd, of the Society for Electrical Development, New York, told of a conference to be held by the Board of Directors of that organization the early part of March, at which the League was requested to be represented, for the purpose of discussing ways and means of furthering the electrical industry throughout the United States. It is quite likely the Pacific Coast will be represented at this important gathering.

The speaker of the day, Mr. J. J. Tynan, Superintendent of the Union Iron Works, was unavoidably detained from the meeting, but sent Mr. R. H. Postlewaite, manager of the Mining Department, as his representative, who read a most interesting paper on "Manufacturing Conditions in San Francisco."

THE ELECTRICAL CONTRACTORS' DEPARTMENT

STANDARD SPECIFICATIONS FOR WIRING BUILDINGS.

The Portland Railway, Light & Power Company has submitted to the architects of Portland some valuable data and suggested specifications on wiring buildings in the hope that they may be of assistance in drawing up lighting plans and specifications. The company suggests that it is advisable when erecting a building to have it wired with sufficient capacity to provide for all probable future requirements. Although the first tenant may only want to use one watt per square foot of floor area, the next one may want to use 2 watts, and for that reason, the wiring should be of sufficient capacity to supply 2 watts per sq. ft. of floor area.

A schedule is given below showing the number of watts per sq. ft. of floor area being used in various stores in Portland.

	Kind of lamps used	Watts per sq ft.
Butcher Shop, 1st and Alder	Tungsten	2.00
Meat Company, 1st and Alder	Tungsten	1.37
Concordia Club—Ladies' Room	Nernst	5.00
Oregon Hotel Lobby and Office	Gem and tungsten	1.72
Portland Hotel Dining Room	Gem	2.35
Restaurant, 146 5th St.	Tungsten	1.33
Restaurant, 305 Washington	Gem and tungsten	2.50
Restaurant, 311 Washington	Gem and tungsten	2.20
Saloon, 143 3d St.	Tungsten	1.78
Saloon, 122 4th St.	Gem and tungsten	1.36
Saloon, 5th and Washington	Gem and tungsten	2.20
Saloon, 309 Washington	Gem	2.22
Confectionery, 273 Morrison	Gem and tungsten	1.56
Confectionery, 274 Washington	Tungsten	2.70
Cigar Store, 141 3d St.	Tungsten	3.40
Cigar Store, 3d and Washington	Tungsten	3.45
Cigar Store, 4th and Washington	Tungsten	2.00
Cigar Store, 5th and Washington	Tungsten	4.68
Cigar Store, 5th and Washington	Tungsten	2.45
Cigar Store, 7th and Washington	Tungsten	3.30
Cigar Store, 364 Washington	Tungsten and Nernst	2.00
Cigar Store, 147 3d St.	Tungsten	2.40
Cigar Store, 286 Washington	Tungsten	2.30
Clothing Co., 289 Washington	Tungsten & elect. arcs	2.62
Clothing Co., 329 Washington	Tungsten	2.00
Clothing Co., 166 3d St.	Tungsten	2.50
Clothing Co., 1st and Morrison	Tungsten	2.00
Clothing Store, 4th and Morrison	Elect. arcs	1.63
Clothing Co., 241 Morrison	Tungsten	3.14
Drug Co., 151 3d St.	Tungsten and Gem	2.90
Drug Co., 4th and Washington	Tungsten and Gem	1.42
Drug Co., 7th and Washington	Tungsten	2.45
Fur Co., 334 Washington	Tungsten	2.70
Hardware, 305½ Washington	Tungsten	1.45
Hardware, 345 Wasnington	Tungsten & elect. arcs	2.00
Jewelry Co., 1st and Washington	Tungsten	2.30
Jewelry Co., 268 Washington	Tungsten	2.50
Jewelry Co., 272 Washington	Tungsten	2.57
Jewelry Co., 294 Washington	Tungsten	3.80
Jewelry Co., 307 Washington	Tungsten	2.50
Jewelry Co., 283 Washington	Tungsten	1.25
Belding Bros. & Co., 345½ Wash	Tungsten	3.85
Shoe Store, 7th and Washington	Nernst	1.53
E. P. Charlton, 288 Washington	Tungsten	2.57

Show window illumination cannot be figured in terms of watts per sq. ft. but can be figured in terms of watts per lineal foot of window.

Following is a list showing number of watts being used per foot, the size of lamps, and the distance between lamps in four stores in Portland:

	Watts per lineal ft.	Size of tungsten lamps.	Distance between lamps.
Ben Selling, 4th and Morrison	40 watts	40 watt	1 ft.
R. M. Gray, 4th and Morrison	40 watts	40 watt	1 ft.
Sam'l Rosenblatt, 3d and Morrison	40 watts	60 watt	1½ ft.
Olds, Wortman & King	50 watts	100 watt	2 ft.

Following is an example showing how the "watts per sq. ft." shown in the upper schedule were obtained:

The example: Clothing store, 286 Washington street; size of store 15 ft. x 36 ft., equals 540 sq. ft. Number and size of lamps:

5-100 watt tungsten equals..... 500 watts
3-250 watt tungsten equals..... 750 watts

Total watts equals.....1250 watts

Dividing total watts by floor space area, we have 1250 watts divided by 540 sq. ft., equals 2.3 watts per sq. ft.

Since most storekeepers wish to use either one 150 watt or one 250 watt tungsten lamp on each outlet, it is wise to provide outlets of that capacity.

To find number of outlets required, first decide how many watts per sq. ft. and how many watts per outlet you wish to provide, then use the following formula.

$$\text{Number of outlets equal} \frac{(\text{floor area}) \times (\text{watts per sq. ft.})}{\text{watts per outlet.}}$$

A 16 candle-power lamp takes 50 watts and since it is customary to indicate the capacity of electric outlets on plans by showing the number of 16 candle-power lamps that each outlet is to be wired for, divide the number of watts per outlet by 50 watts to find the number of 16 candle-power lamps per outlet.

Therefore an outlet which is to have sufficient capacity for a 150 watt lamp should have the numeral "3" written beside the outlet character, and one which is to have capacity for a 250 watt lamp, should have "5" written beside the character.

Candle power and Current Consumed by Various Lamps in Common Use in Portland in 1911.

Nominal Designation.	Candle-power.	Watts consumed.	Candle-power.
16 candle-power	16	50	3.1
No. 1 Gem	20	50	2.5
No. 3 Gem	50	125	2.5
No. 4 Gem	75	187	2.5
No. 5 Gem	100	250	2.5
40 watt tungsten or Mazda	32	40	1.25
60 watt tungsten or Mazda	48	60	1.25
100 watt tungsten or Mazda	80	100	1.25
150 watt tungsten or Mazda	120	150	1.25
250 watt tungsten or Mazda	200	250	1.25
Enclosed arc (approx.)	450	600	1.33
Intensified arc (approx.)	450	600	1.33
		In Series	
Flaming arc (approx.)	1000	500	.5
		In Multiple	
Flaming arc (approx.)	1000	1000	1.0

N. B.—Candle-power ratings of arc lamps in this schedule are based on their illuminating values, as compared with tungsten lamps.

Note:—The lamp commonly termed "16 c.p." as at present furnished by the P. R. L. & P. Co. is in reality a 20 c.p. G.E.M. lamp.

(To be continued.)

TRADE NOTES.

The Bryant Electric Company, and The Perkins Electric Switch Manufacturing Company announce the removal of their San Francisco offices and warehouses to the second floor of the Greenwood Block, 149 New Montgomery street.

The Salt Lake & Ogden Railway Co., Salt Lake City, Utah, will add to its rolling stock equipment, nine G.-E.-205, 100 h. p., four-motor car equipments, with Sprague-General Electric type "M" multiple unit control. The General Electric Company will supply the apparatus and make the installation.

The Great Northern Railway Co., St. Paul, Minn., recently bought two gas-electric motor cars from the General Electric Company. These will be of the large 70-ft. type, and will be placed in service on the branch line of the Great Northern System running between Rockport and Anacortes, Wash.

The Spaulding Building in Portland, Oregon, is installing an independent electric plant. It consists of two 75 kw., 100-220 volts, d. c., 3-wire generators directly coupled to two engines. The generators are being furnished by the Triumph Electric Company of Cincinnati Ohio and the engines by the Lyconing Engine Company.

INDUSTRIAL

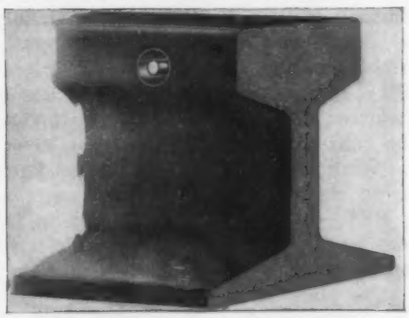
A NEW RAIL BOND.

An entirely new method of securing contact is used in a bond just placed on the market by the Ohio Brass Company of Mansfield, Ohio, and known as their Type J all-wire rail bond. Reference to the illustrations will show the novel features of construction which are fully protected by broad patents. A pin is formed in the center of an annular hole milled in the rail by a hollow cutter. This pin fits into a hole drilled in the bond terminal and, being an integral part of the rail, makes current carrying contact on the inside of the terminal in addition to that secured on the outside as in the ordinary bond.

The Bond.

The bond is installed on the ball of the rail by driving the terminal home with a hammer. This operation compresses the copper and causes it to grip both the outer surface of the hole and the central pin. Mechanically, the bond is on to stay.

Electrically, the contact surfaces C, D and E are more than are required for the capacity of the bond. The contact surface C on the pin B is absolutely protected against moisture and other corrosive elements, being far removed from the outer surface of the rail.



The Annular Hole in Ball of Rail.

A special hollow milling cutter is provided for milling the annular hole in the rail. It is made of high speed steel and facilities are provided for quickly and accurately regrinding it in the field.

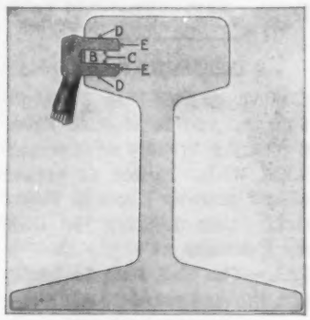
A motor driven milling machine has been developed for use in the installation of this bond. It mills two holes simultaneously, feeding the cutters automatically. When the holes are finished, the cutters are backed out, many times as fast as they were fed in, without stopping or reversing the motor.

The machine can be quickly clamped to the rail or released and is mounted on wheels for moving along the track. Two men can easily lift it from the track to allow cars to pass.

The motor is especially designed for this service and operates on a 550 volt d.c. circuit with a maximum current consumption of approximately 2 amperes. The controlling switch is located on top of the machine within easy reach of the operator.

Two men can mill the holes while a third cleans the holes, installs the bonds, removes crossing planks, etc.

A prominent electric road recently installed many thousands of these bonds and report that under ordinary conditions three men can install from 125 to 150 bonds per ten-hour day.



The Bond Installed.

The Type J bond at present is made only in 4/0 capacity and is designed for use on 60 pound and heavier rails.

Like all other O-B bonds, the Type J is of all-wire construction, the terminals being formed of the same strands that compose the body.

ELECTRICALLY DRIVEN WOOD SAW.

An electrically driven wood saw is one of the latest devices to which Crocker-Wheeler motors have been applied. This wood saw which is the invention of Fred W. Walters, of Norfolk, Va., is said to cut a cord of wood, four pieces to the stick with one kilowatt hour of electricity which at the usual price is seven cents. This is cheaper than any other method now being used by from 25 to 50 per cent, and cheaper than firing a boiler with free fuel.

The motor driving this saw is a Crocker-Wheeler five horsepower induction motor used so extensively in plants where individual drive is essential. This motor is found to be of ample size for the heaviest kind of work and is equivalent to any ten horse power motor connected in the usual way, to shafting.

The motor is direct connected to the saw and insulated so well that there is no possibility of the operator receiving a shock. The portable stand is built of heavy steel angles thoroughly braced and riveted. There are no belts or pulleys to be renewed and the saw and motor runs at a continuous speed of 1800 r.p.m.

The equipment includes a fused starting switch mounted on the side of the motor so that the operator may start or stop the saw without leaving the machine.

RAPID TELEPHONE INSTALLATION.

The Kellogg Switchboard & Supply Company reports that an enterprising telephone company in Michigan recently lost their switchboard by fire. This was a special 200 line magneto board equipped to nearly half its capacity. A rush order was sent to the Kellogg Company for complete cable and rack equipment. Exactly forty-eight hours after the order was received this new equipment was on its way to the Michigan city, thus proving the reliability of Kellogg sales service in emergency requests for types of installations.

NEWS NOTES

INCORPORATIONS.

NEZPERCE, IDAHO.—The Grangeville Electric Company has filed articles of incorporation in this county, expecting to extend its lines to this city.

SANTA ANA, CAL.—Santa Ana Electric Company has filed articles of incorporation; directors being T. W. Neely, Annie H. Neely, J. G. Quick. The company's capital is $16,000.

SALEM, ORE.—The North Pacific Gas & Electric Company has been incorporated by C. J. Franklin, F. L. Shull, H. E. Lounsbury and W. W. Seymour and F. C. Brower; capitalized at $1,000,000. Main offices will be in Portland.

ILLUMINATION.

CHICO, CAL.—An expenditure of about $10,000 on a private power plant to provide electric light for Richardson Springs is being planned by the management of the resort.

LOS ANGELES, CAL.—Notice of voluntary application for dissolution of the Midway Light & Power Company was filed in the Superior Court January 27. Objections must be filed on or before February 28.

FOWLER, CAL.—The San Joaquin Light & Power Company has accepted the one-year contract submitted to them by the city of Fowler for the installation of a new lighting system, and will begin work at once.

REDWOOD CITY, CAL.—The recent election resulted in a decisive victory for the street lighting bonds. The bonds are for $6000, which will be expended by the city in extending the lighting system.

COLUSA, CAL.—The Board of Supervisiors of Colusa county has granted the Oro Electric Company a franchise for 50 years to build and maintain a power line on certain streets and highways of the county.

ALBANY, ORE.—Louis K. Kelsey of Portland is to have plans and estimates for a municipal electric lighting plant ready for submission to the council at the next meeting. The plant is to be capable of supplying current for 600 cluster light poles.

AUBURN, CAL.—The Pacific Gas & Electric Company has several surveying parties in the field surveying a line for a new ditch, from a point about Clipper Gap, to the territory lying between Ophir district and the western boundary of the county.

TRANSMISSION.

VICTORIA, B. C.—The Western Canada Power Company contemplates the installation of two new electrical units at Stave Falls.

TOLEDO, ORE.—Lewis Montgomery, Portland, has purchased the electric plant here. A power house will be built and new machinery installed.

SAN FRANCISCO, CAL.—The Nevada-California Power Company has declared a scrip dividend of $2 a share, payable February 10, to stock of record January 25th.

TACOMA, WASH.—Commissioner of Light and Water Nicholas Lawson, announces that wooden flumes at the Nisqually power plant will be re-placed with steel pipe. Work will be done by the city with pipe on hand.

REDWOOD CITY, CAL.—The franchise for the purpose of distributing electricity from Halfmoon Bay to the southern boundary of the county, has been sold to J. J. Gomes of the Halfmoon Bay Light & Power Company.

ANACORTES, WASH.—In a transaction involving a quarter of a million dollars, the Stone & Webster Corporation of Boston, has acquired the holdings of the Skagit Power Company near Rockport. Plans are said to include the developing of the power site into the biggest hydroelectric generating plant on the Pacific Coast, with power sufficient to electrify all the interurban lines of the company in western Washington. To put the plant in operation will require the expenditure of about six million dollars.

RENO, NEV.—Orders have been given by the Nevada Valley Power Company, which recently filed a $3,000,000 trust deed to secure bonds in that amount, for engineers to report in Reno within 30 days to start work on a power project a few miles from the Derby dam.

PALO ALTO, CAL.—John A. Britton of the Pacific Gas & Electric Company, has suggested a plan whereby the city can take over the local distributing lines and business of the company within the municipal limits. Britton broached his plan at a meeting of the corporation with the members of the Palo Alto board of public works. The meeting was held for the purpose of discussing a proposed ordinance requiring all wires carrying more than 5000 voltage to be carried underground. The matter was referred to Engineers Downing and Lisberger of the company and City Engineer Byxbee and City Electrician Youens.

TRANSPORTATION.

ORANGE, CAL.—The Pacific Electric Company has been granted the right to construct and maintain for 50 years, a railroad upon and across certain streets in this city.

SEATTLE, WASH.—The request of the Puget Sound Traction, Light & Power Company to construct a freight spur at Western avenue and Union street was granted by the board of public works.

PORTLAND, ORE.—Discontinuance of heavy traffic on the Sullivan gulch line and electrification of the road from the waterfront to Troutdale will probably be an early undertaking of the O.-W. R. & N. Company.

EUGENE, ORE.—Plans for the construction of a one story brick passenger depot to be erected here by the Oregon Electric Company will be ready for figures within the next two weeks. Doyle, Patterson & Beach, Worcester building, Portland, architects.

VICTORIA, B. C.—Twenty miles of the line of the Burrard Westminster, Boundary Railway & Navigation Company will be built this year between Stave River Falls and Pitt River. Work will be started in May. Eventually the line will be an electric one.

RENO, NEV.—Joseph Nenzel proposes to interest San Francisco capital in the construction of an electric tramway for the transportation of ore and supplies from Oreana to Rochester. The plans for an electric road from Oreana include the construction of a power plant.

EUGENE, ORE.—From an authentic source comes information that the Oregon Electric Railway will be extended from Eugene to Roseburg via Cottage Grove this season, and that from Roseburg the line will be built to Myrtle Point, to Coos Bay and thence south along the coast to San Francisco.

LOS ANGELES, CAL.—A sixty-day extension has been allowed the Los Angeles Railway Company by the board of public works, on improvement of Boyle street, from Stephenson avenue to Seventh street. Delay in city work has brought about the need of a longer time limit for the railway company's part of the work.

SAN BERNARDINO, CAL.—Bids for grading the Pacific Electric's proposed line to connect San Bernardino and Upland, forming a through service between Los Angeles and San Bernardino, will be opened February 20th, according to

the statement of President Shoup. The Pacific Electric will spend $1,500,000 for this line, exclusive of right-of-way.

SEATTLE, WASH.—The proposition of constructing a tunnel from Fourth avenue and Jefferson street, to Twelfth avenue and Jefferson, a distance of 2800 ft., with sufficient space for double car tracks, cluster lights, roadway and walks, will be taken up by the council if the recommendation of the streets and sewer commissioner is sustained.

LOS ANGELES, CAL.—Bids for the surrender of bonds issued by the Pacific Electric Company, dated March 12, 1902, under deed of trust to the Union Trust Company of San Francisco, will be received up to February 13th, the same to be indorsed "Bids for surrender of Pacific Electric Railway Company 5 per cent bonds, due January 1st, 1942."

SEATTLE, WASH.—The Puget Sound Traction, Light & Power Company has applied to Superintendent of Public Utilities A. L. Valentine for permission to double track its Meridian avenue line from N. Forty-sixth street and Meridian to N. Fifty-eighth street and Latona avenue, a distance of approximately one mile. Work will begin as soon as permission is granted.

EL PASO, TEXAS.—The contract for grading the interurban railroad from Washington Park to Ysleta, a distance of ten miles, has been let by the Rio Grande Valley Traction Company to Dudley & Kerr, contractors, with headquarters in El Paso. Work began February 1. Harry M. Potter, manager of the El Paso Electric Company, will be in charge of the Rio Grande Valley Traction Company's interurban line when completed.

OAKLAND, CAL.—At the annual meeting of the Oakland & Antioch Railway the incumbent officers were elected as follows: S. L. Naphtaly, president; W. Arnstein, vice-president; H. A. Mitchell, secretary and treasurer; John I. Walter, H. C. Breeden, A. W. Maltby and Burke Corbet. As the company is controlled through stock ownership by the Oakland, Antioch & Eastern, there will be no financial statement until the latter corporation has its annual meeting in April.

PORTLAND, ORE.—Electrification of the Mt. Hood Railway & Power Company's line, a subsidiary of the Portland Railway, Light & Power Company, will be started at once and within the next 30 days the trains of this road will be operated by electricity instead of steam over the first section of the system. This portion includes the nine-mile stretch from Montavilla to Gresham. The estimates for the work have already been approved and the work is to start just as rapidly as the labor, material and equipment for the overhead construction, bonding of rails, etc., can be assembled. The cost of electrification of the 23 miles of the road which now extends from Montavilla to Bull Run will cost roughly $160,000 to $175,000, and it is expected to have the entire road under electric motive power some time this summer.

TELEPHONE & TELEGRAPH.

MEDICINE HAT, B. C.—A contract has been awarded for the installation of an automatic telephone exchange for the city. The initial installation will be 2000 lines.

WINBERRY, ORE.—Winberry and Fall Creek residents are building a telephone line to Lowell, The two companies will use the same poles but separate lines will be strung.

BISBEE, ARIZ.—Louis Wolff of Guaymas has been granted concession for the installation of a telephone line between Guaymas and towns in Yaqui River Valley. The work is to begin immediately.

PLACENTIA, CAL.—Manager Lynch of the Pacific Telephone & Telegraph Company at a meeting of the Chamber of Commerce, assured that body that a telephone exchange would be established here within the next 60 days.

SAN FRANCISCO, CAL.—Investigation into the telephone rates has been begun by the board of supervisors, preliminary to the fixing of rates for the ensuing year. Representatives of the board conferred with the Railroad Commissioners and secured the services of Expert James T. Shaw to assist them in this work. The supervisors have begun the hearings which will extend over a period of some weeks.

WATERWORKS.

BERKELEY, CAL.—The first step toward the installing the high pressure water system in Berkeley was taken when the city council directed City Engineer J. J. Jessup to commence plans for a fresh water system.

LOS ANGELES, CAL.—The city of Los Angeles may take over the management of the Terminal Island water system from the city of Long Beach, July 1st. This proposal will be put into the hands of the city council of Long Beach at its next meeting.

VALLEJO, CAL.—Commissioner McCauley stated that he had tentative plans for the purchase of another watershed and the construction of still another large lake, and that a larger pipe line will soon have to be installed. This work will cost $250,000.

REDLAND, CAL.—The municipality of Redlands became the possessor of its own water system when the city paid over to the Domestic Water Company $225,000 for its line, wells and pumps. The city now proposes to improve and enlarge the system at a cost of $75,000.

PULLMAN, WASH.—The city council of Pullman has entered into a contract with B. T. Tannatt of Spokane to test the city wells and see if they have sufficient flow to furnish the city, and if they have, to have the sand removed and a new pumping system installed that will prevent the sand from being forced through the pumps into the pipes.

SAN FRANCISCO, CAL.—Spring Valley is ready to arbitrate the value of its plant or to facilitate the speedy determination of a condemnation suit. The company refuses the city's offer of $37,000,000 and half the impounded money, thus sustaining the stand taken by its negotiating committee. This was the formal answer transmitted to Mayor Rolph by the water company in reply to the formal offer made by the supervisors. On receipt of the letter, Mayor Rolph stated he would take the company's arbitration and condemnation proposition under consideration and submit the letter to the supervisors later.

NEWS OF CALIFORNIA RAILROAD COMMISSION.

Feb. 1.

The Railroad Commission rendered a decision granting the application of Moulton Irrigated Lands Company for authority to issue $250,000 of bonds.

A decision was rendered authorizing the Central California Gas Company to issue $12,500 of 6 per cent preferred stock to cover its organization and promotion expenses.

Feb. 3.

The Raymond Telephone Company applied for authority to raise rental service between Raymond and The Pines, via Coarse Gold and Fresno Flats, in Madera county, from $1 to $1.50 per month for residences; and from $1.50 to $2.00 per month for business telephones.

A decision was rendered granting a certificate of public convenience and necessity to the Los Angeles Gas & Electric Corporation to construct and operate a pipe line for conducting natural gas along certain highways in Los Angeles county.

Feb. 5.

A decision was rendered denying the application of the United Railroads of San Francisco to issue $2,350,000 of 6 per cent, five-year notes, and of the Market Street Railway Company to issue as collateral for these notes, $2,150,000 of its 5 per cent bonds. The commission sets forth at length its reasons for denying the application.

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